

Chemistry Quiz
Molecular Structure, Shape, and Properties
Instructor's Version

Answers to Section I (Multiple Choice)

1.	A
2.	D
3.	A
4.	C
5.	D
6.	B
7.	C
8.	E
9.	B
10.	C

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Answers to Section II (Free Response)

Time Limit: You have 30 minutes to complete this section.

Scoring: 60 points total; question 1 is worth 30 points and question 2 is worth 30 points; points for each section are indicated within the question.

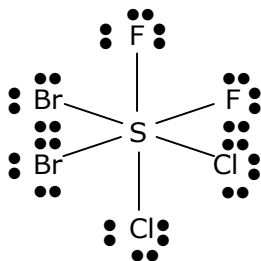
Calculator Use: You may not use a calculator on either problem.

1. A hypothetical molecule has the formula $\text{SF}_2\text{Cl}_2\text{Br}_2$.

A. Draw an acceptable Lewis structure for this molecule. (8 points)

Answer:

Valence $e^- = 6 + 7(6) = 48$ total



B. What is the molecular geometry of $\text{SF}_2\text{Cl}_2\text{Br}_2$? (8 points)

Answer:

6 groups = octahedral e^- geometry; all 6 groups are atoms so molecular geometry will also be octahedral.

C. Describe the bond angles between the central atom and peripheral atoms. (8 points)

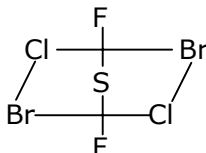
Answer:

Bond angles: All will be 90° since it is octahedral.

D. If the molecule is nonpolar, what can you conclude about the arrangement of the atoms? Explain your reasoning. (6 points)

Answer:

Nonpolar: dipoles must cancel out $\rightarrow$ molecule must be symmetric. That is, the two atoms of a given halogen will be 180° apart:

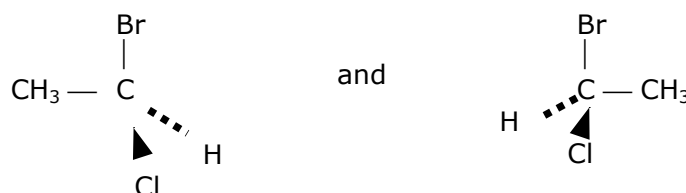
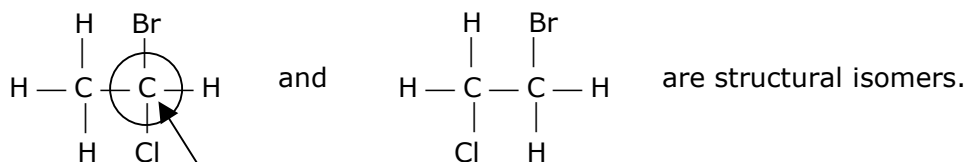


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2. For each compound, draw the structure(s) of all isomers and identify the kind(s) of isomers that are illustrated.

A. C_2H_4BrCl (10 points)

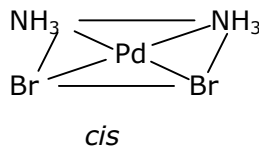
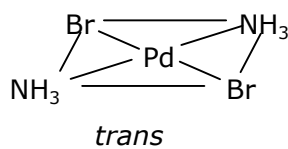
Answer:



B. $Pd(NH_3)_2Br_2$ (a square planar complex). (10 points)

Answer:

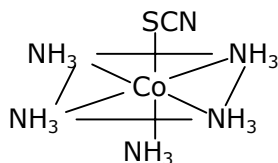
Geometric isomers: *cis* and *trans*



C. An octahedral complex with a central cobalt(III) and six ligands: five ammonia molecules and one thiocyanate ion, SCN^- . (10 points)

Answer:

Linkage isomers: connected through the S or the N



and

